REMARKS

Applicant respectfully requests reconsideration of this application in view of the following remarks.

Status of the Claims

Claims 1-22 are pending. Claim 6 is currently amended. No claims have been canceled. No new claims have been added.

Response to Rejection under 35 U.S.C. § 112

Claim 6 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant respectfully submits that claim 6, as amended, satisfies the requirements of 35 U.S.C. § 112, second paragraph, and respectfully requests the withdrawal of the rejection of the claim.

Response to Rejections under 35 U.S.C. § 102(e)

Claims 1-3, 5, 7-8, 11-13, 16-18 and 21 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Erdogan (US20030112860), which has a publication date of June 19, 2003. Applicant does not admit that Erdogan is prior art and reserves the right to swear behind the reference at a later date. Nonetheless, Applicant respectfully submits that Applicant's invention as claimed in claims 1-3, 5, 7-8, 11-13, 16-18, and 21 is not anticipated by Erdogan.

Section 102(e) of 35 U.S.C. specifies that "[a] person shall be entitled to a patent unless ... the invention was described in ... an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent...."

According to the United States Patent and Trademark Office Manual of Patent Examining Procedure (M.P.E.P.), "[t]o anticipate a claim, the reference must teach every element of the claim. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." (M.P.E.P. § 2131 (2006).)

Claims 1-3, 5, and 7

Claim 1 reads:

> An apparatus, comprising:
>
> a receiver configured to receive multi-tone signals, wherein the receiver has a Time Domain Equalizer filter employing an algorithm to shorten a length of an incoming impulse response to equal to or less than a guard period by calculating a minimum mean square error solution in combination with measuring an inter-symbol interference of a channel.

The Examiner asserts that Erdogan discloses all elements of claim 1, including calculating a minimum mean square error solution in combination with measuring an inter-symbol interference (ISI) of a channel. Applicant traverses and asserts that Erdogan fails to disclose measuring an ISI of a channel.

The Examiner cites paragraph 0481 of Erdogan, which states:

> In order to minimize the minimum mean least square error between the parallel communication channels (i.e., the impulse channel and the delay channel), it is necessary to calculate the TEQ filter coefficients used in generating the Equalizer Coefficient Vector w^T such that the resultant vector has minimum energy Inter Symbol Interference (ISI) and Inter Channel Interference (ICI).

The Examiner asserts that to determine whether a resultant vector has minimum energy ISI, it would be necessary to measure the ISI. However, Erdogan does not disclose measuring an ISI of a channel. Erdogan discloses calculating TEQ filter coefficients using a MMSE approach that minimizes the residual energy of the channel outside the target channel length following the

combination of the actual channel and the TEQ filter. This is not the same as measuring an ISI of a channel. As Erdogan notes in paragraph 0395, "[t]he resulting TEQ filter shortens the overall channel response such that residual energy of the overall channel outside the target length is minimized. In applications, such as DMT, TEQ filters obtained through the algorithm of the present invention [sic] provides minimum energy Inter Symbol Interference (ISI)." (¶0395, emphasis added.) Thus, although Erdogan notes that ISI is minimized when his selected MMSE criterion is used to design the filter, Erdogan does not disclose calculating a minimum mean square error solution in combination with measuring an inter-symbol interference (ISI) of a channel.

Thus, because Erdogan does not disclose measuring an ISI of a channel, Applicant respectfully submits that claims 1-3 are not anticipated by Erdogan under 35 U.S.C. § 102(e) and respectfully requests the withdrawal of the rejection of claims 1-3. The next section provides additional support for the request to withdraw the rejection of claim 3.

Claim 3

With regard to the additional elements of claim 3, the Examiner asserts that Erdogan discloses a delay compensation module to determine an initial delay value to apply to the impulse response as well as supply a set of delay values for the MMSE solution. Applicant traverses and asserts that Erdogan does not disclose using an initial delay value to apply to the impulse response or supplying a set of delay values for the MMSE solution.

Erdogan refers to "a delay module for adaptively computing at least one equalization delay parameter" (¶0013), and the Examiner says "the equalization delay parameter is interpreted as the initial delay value." However, neither this paragraph nor any other part of Erdogan discloses using an initial delay value; instead, in paragraph 0013 and elsewhere, Erdogan

contemplates the use of multiple delay parameters. Erdogan does not convey that a parameter is the same as a value. In fact, Erdogan distinguishes between the two: "In this section, various algorithm parameters, which may include predetermined constants independent of the data, may be used in the algorithm of the present invention. Their values may be adjusted to achieve different levels of performance and stability as well as other results." (¶0418, emphasis added.) Thus, Erdogan defines a "parameter" as taking on a value, and not the value itself. Consequently, the equalization delay parameter of Erdogan cannot be the initial delay value of claim 3.

Furthermore, Erdogan fails to disclose supplying a set of delay values for the minimum mean square error solution. The Examiner says "[a]lthough not explicitly disclosed, Erdogan suggests more than one delay parameter." However, the application fails to disclose supplying a set of delay values to the MMSE computation. Indeed, Erdogan teaches away from using a set of values by saying "it has been observed that for a typical scenario, there is a relatively wide region around d_c where the performance of the filter does not change, where d_c is the effective delay corresponding to the starting location of the non-zero segment of the impulse response." (¶0507.) Therefore, in contrast to suggesting the use of more than one delay value to compute the MMSE solution, Erdogan explicitly says there is a wide range of values for d_c that will provide identical results.

Thus, Applicant respectfully submits that the elements of claim 3 are not anticipated by Erdogan under 35 U.S.C. § 102(e) and respectfully requests the withdrawal of the rejection of claim 3.

Claims 8, 11, and 12

The Examiner asserts that Erdogan discloses all elements of claim 8, including creating a set of values around the first value estimate. Applicant traverses and asserts that Erdogan fails to disclose creating a set of values around the first value estimate to shift the impulse response that includes at least the first value of the delay and a second value for the delay.

The Examiner cites paragraph 0507 of Erdogan as creating a set of values around the first value estimate. However, this paragraph teaches away from creating a set of values by saying "it has been observed that for a typical scenario, there is a relatively wide region around d_c where the performance of the filter does not change, where d_c is the effective delay corresponding to the starting location of the non-zero segment of the impulse response." Furthermore, the Examiner cites paragraph 0013 as suggesting the use of more than one delay parameter, where the delay parameter is interpreted as the delay value. However, as discussed previously in the response to the rejection of claim 3, Erdogan does not teach that a parameter is the same as a value; Erdogan distinguishes between parameters and values in paragraph 0418.

Thus, Applicant respectfully submits that claims 8, 11, and 12 are not anticipated by Erdogan under 35 U.S.C. § 102(e) and respectfully requests the withdrawal of the rejections of claims 8, 11, and 12.

Claims 13, 16, and 17

With respect to claims 13, 16, and 17, all of the claim limitations have been analyzed and addressed in the above response to the rejections of claims 8, 11, and 12. Therefore, Applicant respectfully submits that claims 13, 16, and 17 are not anticipated by Erdogan under 35 U.S.C. § 102(e) and respectfully requests the withdrawal of the rejections of claims 13, 16, and 17.

Claims 18 and 21

With respect to claims 18 and 21, all of the claim limitations have been analyzed and addressed in the above response to the rejections of claims 8, 11, and 12. Thus, Applicant respectfully submits that claims 18 and 21 are not anticipated by Erdogan under 35 U.S.C. § 102(e) and respectfully requests the withdrawal of the rejections of claims 18 and 21.

Response to Rejections under 35 U.S.C. § 103(a)

Section 2143 of the United States Patent and Trademark Office's Manual of Patent Examining Procedure states that

> [t]o establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

M.P.E.P. § 2143 (2006). Therefore, to traverse the rejections, one must show either (1) there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings, or (2) if such suggestion or motivation exists, there is no reasonable expectation of success (for example, if the reference teaches away from the approach or combination), or (3) the prior art references, whether standing alone or together, fail to teach or suggest all claim limitations.

Claim 4

Claim 4 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Erdogan (US20030112860) as applied to claim 1, and further in view of Wynn (US5952914). Applicant respectfully disagrees with the rejection because the combination is improperly motivated and furthermore does not teach each and every element of the invention as claimed in claim 4.

Erdogan discloses the use of a single delay value in the MMSE calculation. Erdogan states that "the delay value, d, is fixed as the starting location of the non-zero segment of the target impulse response." (¶0493, emphasis added.) Thus, only a single delay value is used; the value is the sample number at which the target impulse response first deviates from zero. Erdogan then teaches away from using multiple delay values: "[I]t has been observed that for a typical scenario, there is a relatively wide region around d_e where the performance of the filter does not change, where d_e is the effective delay corresponding to the starting location of the non-zero segment of the impulse response." (¶507.) Thus, Erdogan explicitly discourages experimenting with the delay to find the best solution because the performance of the TEQ filter is the same for a wide range of delay values.

Wynn discloses a MMSE adaptive filter in which the weights of the filter taps are updated using an input signal that is delayed by an amount proportional to the total number of delays applied to the input signal by the delay units (col. 5, lines 1-5). This structure is simply a finite impulse response (FIR) filter in which each tap is updated differently to account for the passage of time. Wynn does not teach delaying the filter input by the same value in the calculation of all taps of the MMSE filter; it teaches delaying the input by a different amount to calculate each tap.

The combination of Erdogan and Wynn is improperly motivated because neither reference suggests the combination. Additionally, Applicant sees no indication that a power line system would use a TEQ, and therefore these systems have no need for algorithms to determine TEQ filter coefficients. Thus, neither reference motivates the combination. Applicant asserts that no one skilled in the art of digital subscriber line technology would look to a power line system for guidance on TEQs. Furthermore, because neither Erdogan nor Wynn teaches the use

of multiple delay values to find the best TEQ filter, the combination cannot be interpreted to disclose the claimed element.

Therefore, per the test in M.P.E.P. section 2143, the combination does not render obvious Applicant's invention as claimed in claim 4, and Applicant respectfully requests the withdrawal of the rejection of the claims under 35 U.S.C. § 103(a).

Claims 9, 14, and 19

Claims 9, 14, and 19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Erdogan (US20030112860) as applied to claim 8, and further in view of Tsujimoto (US5524125). Applicant respectfully disagrees with the rejection because the combination does not teach each and every element of the invention as claimed in claims 9, 14, and 19.

Tsujimoto concerns interference cancellation and adaptive equalization for fading diversity channels, that is, for use in wireless environments. Tsujimoto teaches how to set the adaptation step sizes of adaptive filters to prevent conflicts between multiple adaptive filters that are converging simultaneously.

As the Examiner noted, Erdogan fails to teach selecting the second value for the delay, where the second value deviates a fixed amount from the first delay, and calculating a second MMSE based on the second value for the delay. Tsujimoto also fails to teach these elements. Tsujimoto teaches how to set the adaptation step sizes of two or more adaptive algorithms, such as least mean squares (LMS), to control the speeds at which the algorithms converge. In particular, Tsujimoto teaches avoidance of the system instability that can result when two or more adaptive components converge simultaneously: "Generally, when a system has a plurality of control loops, a conflicting problem between the control loops is sometimes caused to happen. In order to solve this problem, the difference of response speed (time constant) should be made

between the control loops." (Col. 10, lines 47-51.) The patent states that "the response speed of the second MMSE control system should be predetermined to be larger than that of the first MMSE control system. Namely, the adjusting factor of the second MMSE control system should be made larger than that of the first MMSE control system, with respect to algorithms, such as the aforesaid LMS algorithm, for adjusting the tap factors." (Col. 10, lines 56-62.) Thus, the adjusting factor in Tsujimoto is not a delay but rather a step size to control how quickly a control loop converges. Thus, Tsujimoto also fails to teach selecting the second value for the delay, where the second value deviates a fixed amount from the first delay, or calculating a second MMSE based on the second value for the delay.

Therefore, because neither Erdogan nor Tsujimoto teaches all elements of claims 9, 14, and 19, the combination cannot render obvious these claims. Accordingly, Applicant respectfully requests the withdrawal of the rejection of claims 9, 14, and 19 under 35 U.S.C. § 103(a).

Claims 10, 15, and 20

Claims 10, 15, and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Erdogan (US20030112860) and Tsujimoto (US5524125), further in view of Tsuie (US20040223449). Applicant respectfully disagrees with the rejection because the combination does not teach each and every element of the invention as claimed in claims 10, 15, and 20.

Claim 10 reads:

> The method of claim 8, further comprising:
>
> receiving a measurement of a second value of an inter-symbol interference of a channel after the second minimum mean square error is applied to the multiple tone signal;
>
> identifying the lowest value for the measured inter-symbol interference of a channel and selecting the delay value associated with that measurement; and

shortening a length of an incoming channel impulse response by applying a time-domain equalizer algorithm that uses the selected delay value to shorten the length of incoming impulse responses to approximately equal to or less than a guard period.

Erdogan does not disclose measurement of a second value of an inter-symbol interference (ISI) of a channel. Erdogan calculates the TEQ filter coefficients using a MMSE approach that minimizes ISI, but Erdogan does not disclose measuring ISI. Thus, Erdogan fails to teach this element of claim 10.

Furthermore, the combination of Erdogan and Tsujimoto fails to teach the application of the second MMSE to the multiple tone signal. Tsujimoto does not teach the use of a second MMSE value. As discussed in the analysis and response to the rejection of claims 9, 14, and 19, Tsujimoto teaches how to set the step size of an adaptive algorithm, such as least mean squares (LMS), to control the speed at which the algorithm converges to a solution. The adjusting factor in Tsujimoto is not a delay but rather a step size to control how quickly a control loop converges. Thus, Tsujimoto fails to teach the use of a second MMSE value.

As the Examiner noted, the combination of Erdogan and Tsujimoto fails to teach identifying the lowest value for the measured inter-symbol interference of a channel and selecting the delay value associated with that measurement. Tsuie also fails to teach this element. Tsuie teaches a method to detect the mode of an orthogonal frequency division multiplexed (OFDM) signal. By "mode," the inventors are referring to the situation in digital video broadcasting in which the guard interval (cyclic prefix) and the number of samples per OFDM symbol can vary because the OFDM transmitter is allowed to select what it decides is the appropriate combination. In order to enable decoding, then, the receiver must determine both the symbol duration and guard interval selected by the transmitter.

The part of the application cited by the Examiner concerns the reason why OFDM systems require a guard time. The inventors point out that the guard time is necessary to "eliminate even the very small ISI that results" when very long OFDM symbols are used for transmission. (¶0010.) Here, the inventors are simply acknowledging that because real wireless channels are not ideal, even when a very long symbol is used for transmission, a small amount of ISI will likely occur. The inventors then note that using a cyclic prefix mitigates this residual ISI. Thus, Tsuie does not teach identifying the lowest value of the measured ISI. Tsuie merely observes that under the conditions recited, some small, but unspecified and unmeasured, amount of ISI exists.

Thus, because neither Erdogan nor Tsujimoto nor Tsuie teaches measuring ISI or identifying the lowest value for the measured ISI and selecting the delay value associated with that measurement, the combination of references cannot be interpreted to disclose the claimed elements. Consequently, the combination cannot render obvious Applicant's invention as claimed in claims 10, 15, and 20, and Applicant respectfully requests the withdrawal of the rejection of the claims under 35 U.S.C. § 103(a).

Claim 22

Claim 22 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Erdogan (US20030112860) as applied to claim 18, and further in view of Parr (US5627859). Applicant respectfully disagrees with the rejection because the combination does not teach each and every element of the invention as claimed in claim 22.

As the Examiner notes, Erdogan fails to teach an apparatus wherein the estimation of the first value for the center delay is based on a best linear fit to a phase of a channel frequency response. Parr also fails to teach this element. Parr discloses a digital infinite impulse response

(IIR) filter. In the portion of Parr cited by the Examiner, the inventor points out that the disclosed filter offers a frequency response that has a more constant group delay than that of alternative filters, which results in a filter with a more linear phase response, that is, a filter with a fixed delay as a function of frequency. Because the delay is fixed, no estimation process is necessary. Thus, Parr fails to teach estimation of a first value for the center delay.

Furthermore, because neither Erdogan nor Parr teaches all elements of claim 18, from which claim 22 depends, namely creating a set of values around the first value estimate to shift the impulse response that includes at least the first value of the delay and a second value for the delay, the combination of references cannot be interpreted to disclose the claimed elements. Therefore, the combination cannot render obvious Applicant's invention as claimed in claim 22, and Applicant respectfully requests the withdrawal of the rejection of the claim under 35 U.S.C. § 103(a).

CONCLUSION

It is respectfully submitted that in view of the amendments and remarks set forth herein, the rejections and objections have been overcome. Applicant reserves all rights with respect to the application of the doctrine equivalents. If there are any additional charges, please charge them to our Deposit Account No. 02-2666. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: 7-3-07

/Thomas S. Ferrill/
Thomas S. Ferrill
Reg. No. 42,532
Tel.:(408) 720-8300

1279 Oakmead Parkway
Sunnyvale, CA 94085